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ABSTRACT

Combining concepts of cognitive theory with those of rhetoric and linguistics can help writing teachers understand the kinds of activities that will enable basic writers to produce syntactic constructions appropriate for the content they have generated. A review of research studies of sentence combining, syntactic constructions, grammatical chunking, and other transformational theories demonstrates the necessity for understanding the input of short-term memory on language-processing activities. After determining that a student in fact has difficulty with a particular transformation, such as infinitive phrases, increasingly complex appropriate exercises can be designed so the student can reconstruct them correctly and eventually rewrite previously written papers using that transformational structure. The intent of such sequenced activities is to accustom students to using sophisticated syntactic patterns without averting their attention from the content of their writing. Teaching the process of revision becomes easier when inexperienced writers understand that short-term memory limits their ability to convey full meaning in a first draft, and the ability to "chunk" sophisticated syntactic structures can help them hold more content in memory while writing down their thoughts. Language-processing activities should be designed to make language a tool that serves content. (AEA)

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Creating the Memory of Unheard Sentences

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CREATING THE MEMORY OF UNHEARD SENTENCES

Much valuable work has been done in the field of composition in recent years in the area of invention, particularly with the development of heuristics. Much valuable work has been done in the area of syntactic complexity, particularly with the development of the concept of the T-unit and with sentence-combining. Increasingly interest has focused on integrating the area of conceptual development with the expression aspect.[1] To these concepts from rhetorical theory and linguistic theory can be added concepts from cognitive theory which will allow teachers of writing to understand what kinds of activities, particularly for basic writers, will enable them to produce appropriate means of expression for the content they have generated.

To demonstrate how this can be done, it is necessary first to review and, in some cases, re-evaluate principles that have been expounded in recent research.

My own initial and long-term reactions to John Mellon's assertion that students are able to hold in memory many complex elements to be combined in sentence-combining exercises were ones of downright skepticism:

> In rehearsing the full statement while forming it and appraising its grammaticality, the student experiences it repeatedly and thus in a particularly intensive manner. Lastly, he must retain the fully formed sentence in memory while he writes it, and practice in this mnemonic skill may indeed be crucial.[2]

This skepticism was reinforced by my own experiences with student writers who often entangled themselves in syntactic constructions which they could not handle and by similar observations made by Mina Shaughnessy:

> ...consolidations require several things of the writer. If the dependent unit comes first in the sentence, the writer must suspend the independent unit in his mind while he qualified it (as with introductory adverbial phrases and clauses). If the dependent unit comes between the subject and predicate of the base sentence (as with a relative clause after the subject), the writer must hold the main subject in his mind while he writes out the subject and predicate of the qualifying clause, and then he must return to the predicate of the base sentence. These operations require a memory for written words and grammatical structures that the inexperienced writer may not have. He hears what he says easily enough, but he does not as easily recall what he has written once his hand has moved on to another part of the sentence, and unlike the experienced writer, he is not in the habit of reviewing what he has written but instead moves headlong, as a speaker might, toward the open line, often forgetting the constraints he has set for himself a few words back. This difficulty with "hearing" what has been written leads to bewildering and grammatically unworkable sentences that belie the writer's skill with the language. (Emphasis added)[3]

But a recent re-reading of Frank O'Hare's monograph, Sentence Combining: Improving Student Instruction without Formal Grammar Instruction,[4] in particular his observations about what led him to replicate Mellon's study, when reconsidered in terms of inputs from cognitive psychology about chunking in short-term memory, led me to re-evaluate Mellon's assertion in terms of O'Hare's procedures:

> Years later this researcher chanced on the Mellon treatment and immediately set about solving the sentence-combining problems without benefit of Mellon's grammatical signals. It was a fairly difficult enterprise at first. But it wasn't long before "T:rel)" became "who" or "which" or "that" and, more difficult, "(T:fact)" and "(T:exp)" combined to become "it...that."[5]

T:rel

O'Hare, in effect, was simplifying the linguistic cues so that he himself could process the units of meaning more efficiently. His stated intent, in

his subsequent study, was to give the student systematic and controlled experience in the production of mature sentences without worrying about grammatical theory.[6] Beyond reducing the students' concern with grammatical theory, O'Hare was providing a method whereby meaningful units, phrases or clauses, could each be processed as one "chunk of meaning." This chunking of units was necessary to permit such processing because of the limitations of short-term memory.

The necessity for understanding the input of short-term memory on language-processing activities is clearly delineated by Herbert A. Simon in his article, "How Big Is A Chunk?":

> A crucial role in problem-solving is played by man's short-term memory and the processes that transfer information from short-term to long-term memory (fixation processes). To continue the progress toward understanding complex cognitive behaviors, it is necessary to have good estimates to the basic parameters of short-term memory and of the memory fixation process.[7]

In his seminal article, "The Magical Number Seven, Plus or Minus Two: Some Limits on Our Capacity for Processing Information," George A. Miller set out the prospect of developing a workable definition of "chunks":

> The contrast of the terms bit and chunk also serve to highlight the fact that we are not very definite about what constitutes a chunk of information. For example, the memory span of five words that Hayes obtained when each word was drawn at random from a set of a thousand English monosyllables might just as appropriately have been called a memory span of fifteen phonemes, since each word had about three phonemes in it. Intuitively, it is clear that the subjects were recalling five words, not fifteen phonemes, but the logical distinction is not immediately apparent. We are dealing here with a process of organizing or grouping the input into familiar units or chunks, and a great deal of learning has gone into the formation of these familiar units. (emphasis added)[8]

Miller goes on to explain that "[S]ince the memory span is a fixed number of chunks, we can increase the number of bits of information that it contains simply by building larger and larger chunks, each chunk containing more information than before."[9] Probably the most important observation that Miller makes in reference to the matter under concern here relates to the relationship between memory and chunking: "The process of memorizing may be simply the formation of chunks, or groups of items that go together, until there are few enough chunks so that we can recall all the items".[10]

In an attempt to pursue the reality of the chunk by using words instead of digits and past experience of training, Simon tested recall span for words, hypothesizing that the recall span for words should not depend on the number of syllables the word contain. He found that the span was nearly seven words for one and two syllable nouns and about six words for three-syllable nouns, a variation of some 15 per cent between the extreme conditions. He then investigated the premise that units much larger than words may be highly familiar, hence might serve as chunks. He found that the prediction that he should be able to recall lists of six familiar phrases not substantiated, that four or five seemed to be the limit. Extrapolating from familiar two-word and three-word phrases to longer ones, he found that three such phrases were all he could recall with reliability, although he could sometimes retain four. Simon pointed out that

> 'the constant capacity in chunks' hypothesis is a rough first approximation of the true state of affairs but that it must be refined--perhaps by taking into account the additional time required to rehearse the longer passages--in order to achieve a fully satisfactory fit to the date.[12]

Concerning the two major findings of his review of the research and his own findings, Simon concluded that " [t]he psychological reality of the chunk has been fairly well-demonstrated, and the chunk capacity of short-term memory has been shown to be in the range of five to seven. Fixation of information in long-term memory has been shown to take about 5 or 10 seconds per chunk."[13]

Returning to the relationship between these findings and O'Hare's method for handling Mellon's assertion on retaining the units (or chunks) that need to be processed in the series of embeddings, it is clear that the students who undertook the procedures recommended by Mellon may well have been using O'Hare's strategies as a chunking device. That is, if the student supplied a word such as one later included by O'Hare as the key for the particular transformation to be applied, this would provide the basis for chunking that particular "kernel". Clearly, then, that chunk would likely be retained in short-term memory more easily than if it had to be treated as a series of discrete words, each requiring the space of one of the chunks.

Evidence to support this view comes from a study of the speech mechanisms of thinking. Sokolov presents evidence that "internal intonation" precedes writing and that "the intonation articulation of a text in internal speech becomes a very important factor in determining the syntactic structure and the entire style of the text: by separating individual words or groups of words as logical predicates (by means of "internal intonation"), the writer determines the arrangement of the words and their syntactic connection within the sentence."[14] But this latent articulation depends upon a series of factors: "(1) the difficulty or novelty of a thought action, (2) the degree to which it is automatized, and (3) the inclusion of visual models in the thought activity."[15]

Points (1) and (2) speak directly to the writing processes of basic writers. The conception of a topic for writing and its development has been richly discussed in much current research on the invention process.[16] But assuming that student writers have "something to say," we can direct our thinking to making appropriate language structures available to them for the apt expression of these thoughts. The importance of this relationship between language structure and thought has been pointed out by Dilworth, Reising and Wolfe: "The investigators found that a major distinguishing characteristic of the superior papers is the tendency to coordinate syntactic strategies with the extent and profundity of concept development."[17] It is to the process of making these structures "automatic" (Sokolov's point 2) that the balance of this paper is directed.

The possibility of "teaching chunking" in a systematic way leads to potentially exciting applications to both reading and writing processes. Familiarity with syntactic patterns as a basis for prediction has been identified as one of the elements constituting the psycholinguistic model of reading.[18] That placement of elements within a sentence affects reading has been discussed elsewhere by the author and others.[19]

But a new dimension for consideration grows out of the interaction between syntactic processing and knowledge of chunking information into short-term memory. It appears useful to consider the benefits of constructing embedding exercises sequentially, that is, selecting at the appropriate level for a given group of students, those transformations which are unfamiliar, as Shaughnessey suggests, and using embedding activities to build up the chunking capacities of students. These activities might include introducing a particular transformation, e.g. reduction of embedded kernels in verb phrase

complements to infinitive phrases.

First it is necessary to establish that the student in fact has difficulty with a particular transformation. This must come directly from the student writing. Let me describe as an example one student paper from a Basic Writing course which manifested difficulty with infinitive phrases. In this paper, of approximately 400 words, on the topic of "Child Beating," the student produced seven sentences for which infinitive phrases would have been appropriate. In two of these sentences, the infinitive phrases were accurately constructed:

> There is not much that can be done to protect these children.
>
> If you let the parents keep them, they might not live long enough to become parents themselves.

In three other sentences, the writer substituted noun phrases for infinitive phrases:

> Discrimination laws are set up in the prevention of female discrimination.
> [Laws are set up to prevent discrimination against women.]
>
> Some people are mentally incompetent of caring for a child.
> [Some people are mentally incompetent to care for a child.]
>
> Another mother was reported in the beating of her son with an electric cord from a toaster.
> [Another mother was reported to have beaten her son with an electric cord from a toaster.]

Notice that two of the three of this type replaced the infinitive phrase with a "preposition + Verb-ing + preposition" construction. This "Verb-ing" construction led to further difficulties for this student in two more sentences, one where he substituted a "Verb-ing" construction for an infinitive phrase and one where he produced both an appropriate infinitive phrase and an inappropriate "Verb-ing" construction in the same sentence:

A child's misbehavior might set his father's temper off causing him unvaryingly taking out what happened at work out on the child and start to beat the child.

[A child's misbehavior might set his father's temper off causing him consistently to take out what happened at work on the child and to start beating him.]

About the only thing that can be done is to pray for them and hoping that they won't turn out like their parents.

[About the only thing that can be done is to pray for them and to hope that they won't turn out like their parents.]

As these sentences illustrate, the writer does not yet fully control the syntactic pattern of infinitive phrases. On the basis of the model, he would be provided with appropriate experiences that would make the correct syntactic structures automatic for him so that each phrase or clause could be handled as a single chunk. He could be given particular combinations of kernel sentences which would guide him in the patterns he needs to internalize. These sets of kernels should be fairly simple at first, increasing in complexity until the student is given his own inappropriately formed sentences, now broken down into kernels, and asked to reconstruct them.

After students have constructed embedded variants from original kernels (admittedly an exercise activity), they could be given reading materials which contained sentences using infinitive phrases of various kinds and asked not to de-combine them, but to indicate recognition of them. Then the students could be given passages written by other students (perhaps papers from earlier years) in which there were opportunities to produce infinitive phrases by combining sentences or the need to re-write sentences where infinitive phrases were called for but the previous writers had not taken advantage of them. They could then be asked to re-write appropriate sentences with infinitive phrases. The next stage would be for students to look over papers they had written previously themselves to see if there were opportunities to use this transformation that

they had not previously recognized or to bring forward examples of their prior writing in which they had successfully used this transformation. The final activity, of course, would be for the students to utilize this structure in their own writing as it might be useful and appropriate.

The intent of these sequenced activities is to create what Shaughnessy called "a memory of unheard sentences,"[20] that is, chunks of increasingly sophisticated syntactic patterns which students could use without having to divert their attention from the content of their writing to the formation of the pattern that would carry that content.

Clearly, these activities are intended for students for whom the burden of creating language structures is so overwhelming that all of the capacity of short-term memory is tied up in discrete units, each of which is so small, perhaps a single word or a two-or-three-word phrase, that the writer cannot retain either the larger concept that he/she intended to convey in the phrase or clause or the relationship between that content and the larger content of the entire sentence, paragraph or unit of discourse. At its most inhibiting level, this would be manifested in the preoccupation with spelling which might fill short-term memory with chunks no larger than a single letter each.[21] These sequential activities could reduce the student writer's anxiety about complex syntactical patterns, an anxiety that often manifests itself either in short, safe sentences which inhibit the development of logical relationships among ideas or complex sentences whose syntactic structures interfere with that expression.

Although I had previously believed that non-directive sentence-combining activities of the type developed in William Strong's Sentence Combining[22] were as effective for basic writers as they were for more competent student writers, I find myself forced to re-evaluate this position based on the studies of cognition and of the information load handled by short-term memory. Clearly, the non-directive activities designed by Strong have great benefit in classroom

use as many teachers and students have already testified. But these activities assume a sophistication about syntactic choices being available to student writers that does not often exist for basic writers. As Mina Shaughnessy has pointed out,

> "The acquisition of mature structures merely increases the possibility of a student's making the best choice consistent with his purpose. (There is nothing intrinsically immature about a coordination nor mature about an ablative absolute without reference to intended meaning.)"[23]

The process of revision becomes an important issue also because the limitations of short-term memory prevent all writers from conveying their full semantic intent into written form in an instantaneous manner. Experienced writers are aware of this and adopt revision strategies that are appropriate. Inexperienced writers must be convinced of the "respectability" of re-writing and explanations about the limitations of short-term memory may permit students to understand that first drafts are approximations of what the writer can place on the paper before short-term memory erases the thought. It remains then to fill in the gaps, enlarge the thoughts and build the connections. Experiences with chunking increasingly sophisticated syntactic structures can help the writer to hold greater amounts of content in memory while he/she is writing those thoughts down. Language-processing activities should be designed to make language a tool that serves content.

FOOTNOTES

[1] Dilworth, Jr., Collette B., Robert W. Reising and Denny T. Wolfe, "Language Structure and Thought in Written Composition: Certain Relationships," pp. 97-106 Research in the Teaching of English, Vol. 12, No 2. (May 1978)

[2] John C. Mellon. Transformational Sentence-Combining, Research Report #10 (Urbana, Ill.: National Council of Teachers of English, 1969), p. 24.

[3] Mina P. Shaughnessy, Errors and Expectations (New York: Oxford University Press, 1977), pp. 58-59.

[4] Frank O'Hare. Sentence Combining, Research Report #15 (Urbana, Ill.: National Council of Teachers of English, 1971).

[5] O'Hare, p. 26.

[6] O'Hare, p. 27.

[7] Herbert A. Simon. "How Big Is a Chunk?" Science, Vol. 183 (Feb. 8, 1974), p. 482.

[8] George A. Miller. "The Magical Number Seven, Plus or Minus Two: Some Limits on our Capacity for Processing Information," The Psychology of Communication: Seven Essays (New York: Basic Books, 1967), pp. 36-37. Simon proposes five as the "magic number" in a footnote in his article but points out the exact numerical value of the constant is not crucial and that his analysis depends only on the hypothesis that the capacity of short-term memory is a constant number of chunks, the same for all kinds of stimuli. (Footnote 2, p. 487)

[9] Miller, p. 37.

[10] Miller, p. 41.

[11] Simon, p. 483.

[12] Simon, p. 483.

[13] Simon, p. 487.

[14] A.N. Sokolov, "Studies of the Speech Mechanisms of Thinking," in A Handbook of Contemporary Soviet Psychology, ed. by Michael Cole and Irving Waltzman (New York: Basic Books, 1969), p. 568.

[15] Sokolov, p. 569.

[16] See, for example, the excellent review article by Richard Young, "Invention: A Topographical Survey," in Tate, Gary, ed., Teaching Composition: Ten Bibliographical Essays (Fort Worth, Texas: Texas Christian University Press), 1976, pp. 1-43.

17 Dilworth, Reising and Wolfe, p. 102.

18 Frank Smith. Understanding Reading, 2nd. ed. (New York: Holt, Rinehart and Winston), 1978.

19 Marilyn S. Sternglass, "Composition Teacher as Reading Teacher," College Composition and Communication, Vol. XXVII, No. 4 (December 1976) pp. 378-382); "Developing Syntactic Fluency in the Reading Process," ED 151 785; Dawkins, Syntax and Readability, (Newark, Delaware: International Reading Association), 1975.

20 Shaughnessy, p. 80.

21 This statement is not intended to denigrate the value of correct spelling, only to place it in some perspective in the development of a first draft in writing. Proper attention to spelling can be paid in subsequent drafts.

22 William Strong. Sentence Combining. (New York: Random House), 1973.

23 Shaughnessy, p. 77.